This test covers basic ecological concepts with a focus on how these concepts work deserts and grasslands. There are questions that also relate these ecological concepts to the impacts of alterative energy production.

You may divide the test, but if you do, please put your team number on every page!

My tests tend to be fairly hard. This is a difficult tournament with teams that among the best in the nation. Don't panic if you don't know everything!

Good luck!

Scores:

A: _____

B:_____

C:_____

D:_____

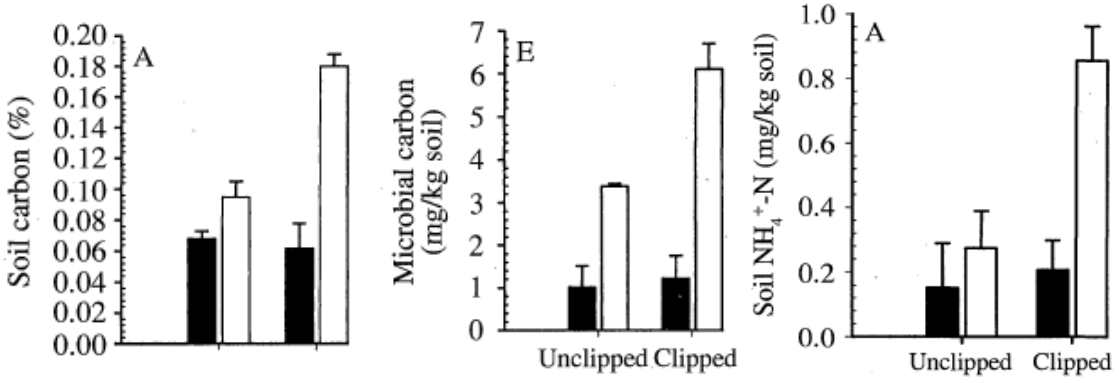
Total: _____

A. Nutrient cycling in grassland ecosystems (30 points)

1. Nitrogen is one of the principal nutrients in most ecosystems. Why? What is it used for? (5 points)

2. Draw a picture of the nitrogen cycle in a grassland ecosystem with examples of an autotroph, herbivore, and decomposer. (10 points)

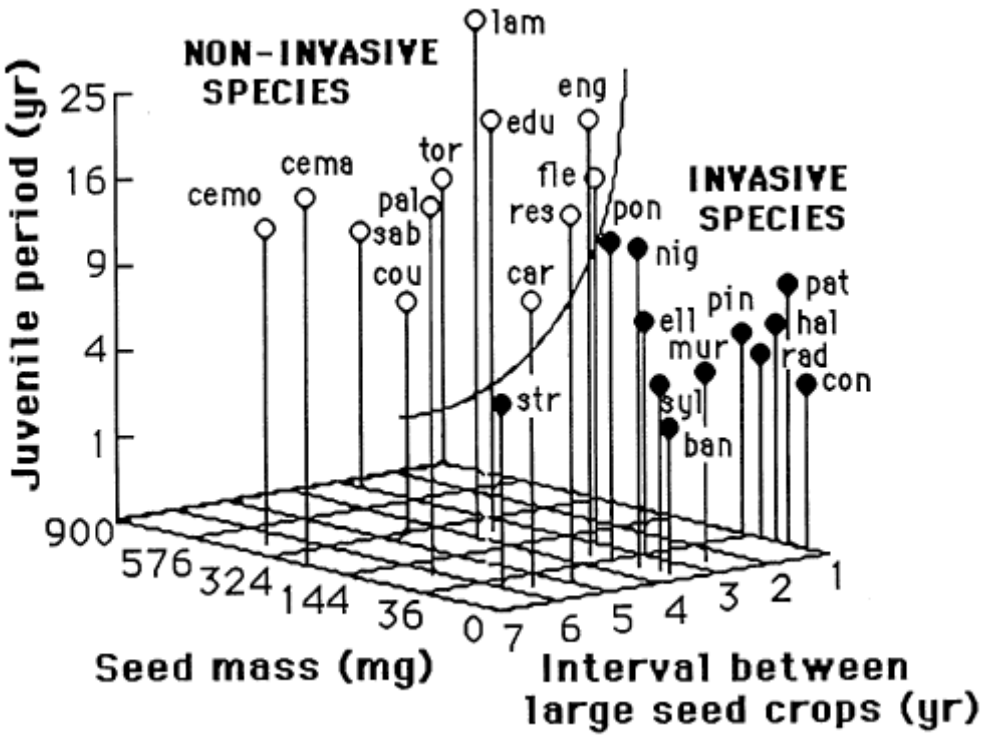
The following plots are used in Questions 3 and 4. They are taken from a paper by Hamilton and Frank in the journal Ecology (v. 82, p. 2397-2402, 2001). This paper asked how plants respond to herbivory, using controlled studies in a number of pots of a grazing tolerant grass, *P pratensis*. The plots each show a quantity at the beginning (black bars) and end (white bars) of the experiment. The left-hand pairs of bars are for pots of grass which were left undisturbed, while the right-hand pairs of are for pots where the leaves were removed from the grass, simulating the effect of grazing.



3. Describe what happens in each of these three plots, contrasting the clipped and unclipped pots.

4. The left-hand plot was used by Hamilton and Frank to argue that after grazing, this species of grass exudes carbon into the ground. Tell me why this is surprising, and connect the center and right-hand plots with your diagram of the nitrogen cycle to tell me why the plants might still do such a thing. (10 points, T1)

B. Invasive species (20 points)



In a classic study, Rejmanek and Richardson (Ecology, 77, 1655-1661, 1996) studied the spread of non-native pine species from plantations. The plot above shows three variables that they found that distinguished whether these species became invasive or not.

5. Describe the difference in reproductive strategies between invasive and non-invasive species from the plot above, and explain why these differences produce the results that they do. (15 points)

6. What does this suggest about using tree biomass for biofuels? (5 points)

C. Short answer (30 points, 5 points each)

7. Location A receives 35 cm of rainfall per year primarily during the summer season. Location B receives 35 cm of rainfall per year primarily during the winter season. Which of these locations is more likely to experience desert conditions? Why?

8. List two physiological adaptations made by animals make in order to survive desert conditions.

9. What is a heterotrophic organism? Give an example from a desert ecosystem.

D. Population ecology in a desert environment

The plot below is taken from a paper by Dickman et al. (Oecologia, 113, 357-366,1999) showing the

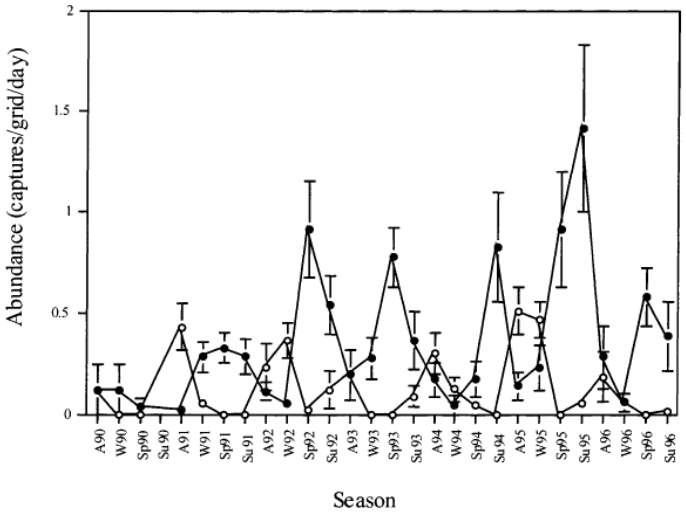


Fig. 4 Abundance of adult (*closed symbols*) and juvenile (*open symbols*) *C. isolepis* over the study period expressed as mean captures per grid per day. Error bars represent ±1 SE (*A* autumn, *W* winter, *Sp* spring, *Su* summer)